

Serial No. 09/614,993

Docket No.: 55085US002

**Amendments to the Specification**

Please amend the indicated portions of the written description as shown below in marked form:

At page 5, lines 7-11:

"partially cure" means increasing the viscosity of a composition to induce film formation or reduce creep or flow, *i.e.*, wherein the physical state of the composition is altered, such as by transforming from a fluid to less fluid state, going from a tacky to a non-tacky state, going from a soluble to insoluble state, or decreasing the amount of polymerizable material by its consumption in a chemical reaction.

At page 6, line 4:

**BRIEF DESCRIPTION OF THE DRAWING DRAWINGS**

At page 6, line 27 through page 7, line 3:

Fig. 12 and Fig. 12a illustrate ~~illustrates~~ an OLED constructed by laminating together two partial OLED structures, at least one of which is made by a method of the present invention.

The present invention is susceptible to various modifications and alternative forms. Some specifics thereof have been shown by way of example in the ~~drawings~~ drawing and will be described in detail. It should be understood, however, that the intention is not to limit the invention to the particular embodiments described. On the contrary, the intention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the invention as described by the following detailed description and as defined by the appended claims.

At page 11, lines 5-12:

A preferred encapsulated OLED structure may have conducting leads, such as indium tin oxide (ITO) leads 44 extending under the bond line and making electrical contact with the anode 46 and cathode 56 as shown in Figures 6 and 7. In this case, the encapsulating film, *i.e.*, the final top layer, would not need to act as an electrical contact.

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In some embodiments, leaving a gap between the protective layer 58 and OLED, as is shown in Figures 6 and 7 may be desirable, for example when including a desiccant in the gap or when protecting the OLED from abrasion is desired. This may be achieved by having the adhesive layer 50 substantially thicker than the OLED element layers 52, 54, 56.

At page 12, lines 13-22:

Figure 2 illustrates an embodiment of an OLED construction after sealing layer 30 has been applied. An exploded view of an exemplary individual OLED structure made by the foregoing method is shown in Figure 3. Adhesive 14 on substrate 12 surrounds OLED elements 16. Sealing layer 30 forms the top layer of OLED construction 10. Cut lines 32 are shown. Cut lines 32 indicate where the structure can be cut through the layers of sealing layer 30, transfer adhesive 14 and substrate 12 to provide individual OLEDs 10 such that the OLED elements 16 are encapsulated by adhesive 14 and sandwiched between substrate 12 and sealing layer 30.

~~An exploded view of an exemplary individual OLED structure made by the foregoing method is shown in Figure 3. Adhesive 14 on substrate 12 surrounds OLED elements 16. Sealing layer 30 forms the top layer of OLED construction 10. A conventional OLED construction without the encapsulating structure of the present invention is shown in Figure 5.~~

At page 14, line 16 through page 15 line 15:

The process of the present invention could be readily carried out using a roll-to-roll continuous web process as illustrated by Figure 4. For example, to prepare an OLED, a roll of flexible substrate 12 with precut adhesive-coated liner mask 14/15 could be fed from roll 230 into vacuum chamber 210 of coater 200 where OLED elements could be deposited by vaporization from deposition sources 220 and 222, which may deposit the first two organic layers of an OLED, corresponding, for example, to layers 104 and 106 of the device shown in Figure 5. Alternatively, A deposition source (not shown in Figure 5) could also furnish ITO anode layer 102 of Figure 5. This step would be followed by a second set of vapor depositions in chamber 212 from deposition sources 224 and 226.

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Typically, deposition sources 220 to 226 will supply all of the layers necessary to produce a working OLED device on substrate 12. It will be obvious to one of skill in the art that the number of deposition sources in processing line 200 may vary according to the OLED device to be built. This step will be followed by removal of release liner 15 onto take-up roll 232 in take-up chamber 214 and application of sealing layer 30 from roll 234 onto exposed adhesive mask 14 to encapsulate and protect the OLED device. Sealing layer 30 may be a counter electrode or a protective layer, depending on the particular construction of the OLED device. Take-up chamber 214 can be under vacuum or can be at atmospheric pressure and filled with an inert atmosphere, such as argon or nitrogen. It will be obvious that the number of vacuum and take-up chambers may vary according to the desired set of process conditions. The finished sheet of OLED devices is then collected on take-up roll 236 from which it can be further dispensed for conversion into individual OLEDs by singulation, as shown in Figures 1-3. Other arrangements and combinations of applied layers are also possible and would be apparent to one skilled in the art. The entire process could be carried out in a controlled atmosphere, such as under a vacuum or nitrogen, to minimize the possibility of environmental damage to the OLED. The finished sheet of OLEDs could be removed from the coater and converted to individual OLEDs by cutting through the adhesively-bonded areas of the electrode and substrate films to give the final (or at least partially) packaged OLED of the general structure shown in Figure 3. Further encapsulation may also be done after fabrication. For example, after an electrode or protective layer is laminated to the OLED structure, an additional protective encapsulating layer may be added by, for example, dipping the entire assembly into a liquid epoxy resin and curing said resin by heat and/or light.

At page 16, lines 8-25:

The use of the in situ edge seal adhesives of the current invention can provide structural stability to OLEDs prepared by physical lamination of two substrates carrying the appropriate active layers. Although there are several ways to apply the current invention to the fabrication of OLEDs by lamination, only one will be exemplified herein. Such fabrication is illustrated by Figure 12 and 12 a. For structure 300, adhesive/liner mask 314/315 may be placed on the metallized side of a polyester film 310

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coated with aluminum 312 and placed into a vacuum deposition chamber. Approximately 5,000 Å of aluminum 316, 10 Å of LiF 318, 400 Å of AlQ 320, and 400 Å of 4,4'-bis(naphthalen-2-yl)-N,N- diphenyl benzidine ( $\alpha$ -NPD) 322 can be deposited in that order. Separately, for structure 400, polyester substrate 328 coated with ITO layer 326 can be coated with 1,000 Å of aqueous poly(ethylenedioxythiophene) (PEDOT) solution 324 and allowed to dry. Both film structures may be transferred to an inert atmosphere glove box. Liner 315 may be removed from structure 300, which structure 300 may then be laminated by heat and pressure to structure 400. Completed OLED device 500 would thus be formed where an interface between active layers 322 and 324, in this example between a hole injecting layer and a hole transport layer, would be created by physical lamination of these two layers. The completed device has improved structural stability by virtue of the adhesive forming the in situ edge seal around the device.

At page 16, line 26 through page 17 line 13:

Finely patterned and addressable devices may be fabricated by the methods of the current invention. For example, a passively addressable monochrome dot matrix display may be fabricated in a roll-to-roll process. ITO on polyester could be patterned by a combination of standard photolithography and acid etching into columns that run across the web. An adhesive/liner mask which contains rectangular openings that define the desired area of the display would be applied to the web. Small molecule OLED layers would be vacuum deposited onto the web or light emitting polymers solution coated onto the web to essentially cover the rectangular ~~opening~~ openings in the adhesive/liner mask. Cathode metal would then be vapor deposited through a slotted mask to create rows of cathode metal parallel to the web direction. The liner would then be removed and a protective film laminated to the passive matrix display. Electrical connection to the anode would be simply made by contacting the columns of ITO that pass underneath the encapsulating adhesive. Electrical connection to the cathode rows could be made in a number of ways. The protective film laminated to the cathode side of the device could carry conductive traces that could be in registration with the rows of anode. These could be in physical contact with the cathode rows or could be attached by, for example, a Z-axis conductive adhesive film. Alternatively, the ITO substrate could be patterned to include

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ITO cathode contact pads, which pass underneath the encapsulating adhesive. The cathode rows can be contacted to these pads by, for example, the use of various deposition masks or by angle evaporation techniques.

At page 27, lines 6-7:

~~The invention provides methods for making encapsulated~~ Encapsulated organic electronic devices including organic light emitting diodes are made using an adhesive component as a mask while the device is being constructed. An adhesive-coated liner can be applied to the device substrate and openings created therein by removing portions of the liner and adhesive, or a patterned adhesive layer having openings therein can be formed on the device substrate, followed by deposition of the device layers and application of a sealing layer.